New Strategies for Prevention and Treatment of Childhood Obesity

Diana Hu, MD, FACP

Diana Hu:

I've actually been a pediatrician here in Navajo basically since my career started out of residency, so I've been on Navajo for almost 30 years now. And I think the main reason that I got really involved in doing this is, you know, when you're on for a long time, you start to see kids and their kids, and their kids, and you begin to realize how things are changing generationally, so this is why my focus is on pediatric obesity. I'm not a diabetologist; I am not an obesity expert. I basically work in the field in maternal child health and child pediatrics, but because I work in the field, my focus is on what we can do specifically those of us that work in clinical settings, a lot of us that work actually with kids every day what we can do based on the research that we have and based on what we know. So let's move ahead with that, okay? Any questions from anybody? Actually I think will be at the end. So that's me. I'm on a river trip that's why I'm here. River trips are great.

Moving onwards, the learning objectives I think you guys have already looked at. The biggest thing that I want to challenge you with at the end of this webinar is to have you specifically try and think of something that you are empowered to do now in your community, because I think that if we wait for the answers to come from lots of -- we always want to practice evidence-based medicine, but our communities need something now and I think there will be a couple of elements that you'll see here in this presentation where you might say, "Hey, that applies to my community." And let's see what we can do to address that issue and hopefully, we can all collaborate on resources that we can use to address those issues.

I have no financial affiliations to disclose. I work for the government; I even have a separate checking account from my husband who also works for the government. This person also works for the government. This is actually who we work for as you can see. The interesting thing is that every President has their own thing that they like to do in terms of their cause. Unfortunately, President Obama has had multiple things on his plate to deal with, but as a very smart individual and as a father of two growing young women, he recognized fairly early that the data coming out of CDC, the data coming out of many different academic institutions, as well as just what you see on the street is that the problem of childhood obesity leading eventually to adult obesity and leading eventually to co-morbidities and potentially early mortality for Native American people as well as American people, is a growing problem. No pun intended. So, he said this in 2010 in the beginning of his first administration. And as a very smart man once again, he decided, like all smart men that he needed to delegate this to someone else. He said, I will set a goal to solve the problem of childhood obesity within a generation so that children born today will reach adulthood with a healthy weight. Once again, as a smart man, he said, I got lots of stuff to do, I'm going to give it to the best person I know who can carry this through as a cause. So, he gave it to his wife.

Now, as you can see and as you all know, I think from your work in obesity that Michelle Obama has been a great champion for us on the federal side. Nationally and internationally, this is one of the things that she has really made a very great impact on, especially, I think the funding and the programs that are available now to address this issue are huge compared to what we had 10, 15 years ago when in Indian country we were recognizing that increasing rates of obesity and diabetes were on the horizon.

She, as you know, created this initiative called, Let's Move! And "Let's Move" means not just let's move, get active, but let's move towards getting better, healthy communities, healthy families, empowering families and children to have a healthy lifestyle. So we're going to move along in this presentation and we'll address this specific concept especially at the end. As you had heard from Gale Marshall, that Let's Move! in Indian County is a specific initiative for us to look at for Native American kids.

Down to the science and the meat of the matter, once again, in terms of definitions, I think you all know about this. I'm not going to belabor this. But the most important thing from this slide to remember is that for children, it's not about a number, it's about a percentile. Because once again, what's a normal BMI for an adult would actually be greater than the 95th percentile and morbid obesity for a three-year-old. So that when you calculate a BMI, once again, it's still done in the same way, taking the weight in kilograms diving by the height in meters and again, by the height in meters will give you a number but you need to be able to use the graphs that I show you now, which are from the CDC, which show the percentiles that change as the child ages.

So this is something that everybody should be doing clinically. We do it in our communities as well and when we go out into schools and et cetera and do our Fitnessgrams. And we're hoping that as time goes on, people will begin to recognize why we do the BMI. I can tell you that, personally, we're doing an initiative here on Navajo looking at Fitnessgrams and giving information back to families and they don't understand it. I mean, when I do it one-on-one in the clinic room, I could be a little more in great detail, but if I talk about percentiles and numbers, people's eyes start to glaze over. So, I think we need to really try and emphasize healthy versus at risk, or potentially unhealthy weight even using those green, yellow, red colors that we use often times for diets and asthma charts and all those kinds of things because that's something that our patients and our communities are going to understand.

If we look at the prevalence of obesity in childhood, you can see, this is a little bit of older data, but this is when we were beginning to recognize the epidemic of obesity, that by definition, greater than the 95th percentile should be 5% of the population. This is not new to any of you guys that it has tripled in the period of time that's shown here and it has stabilized probably over the past decade, but it hasn't gone any better. It has stabilized. So we're still talking about having about three times as many people of having defined obesity. In Indian Country, it may be higher than that.

If you look at the trends in obesity for boys and girls and children, you can see once again the trend line is fairly clear. It's slightly higher in boys than it is in girls. You can see it's flat lined a little bit in the past five years, but it's really nothing to be proud of. We're still off about 15% overall in the whole U.S. and as I mentioned before, slightly higher in Indian Country.

Here, once again, there's a prevalence if you look at Native and different ethnic groups, and it's actually sometimes very difficult to find aggregate Native American data. And those of you that work in Native American country know that there are many different tribes that have very different presentations, very different ethnography, and very different socio-economic status. But if you do the aggregate, you can see who has the highest percent prevalence of obesity, and these are in children that are two to four years of age, so preschoolers and you can see that that is Native American children, which is where the brown arrow is.

Once again, looking for tribe-specific data can be difficult. You can find some tribal specific data actually in the Census as well on the CDC, but this is one of the more recent graphs that shows that if you look at the bottom box in the lower right hand corner, you can see that this is the different tribes and other small ethnic groups. Dark blue is not good, okay? The lighter the color, except for the white ones, where we have no data, but the lighter the color, the lower the prevalence of obesity. This is in low-income children, low-income preschoolers, not adults, but preschoolers. And you can see that in a lot of the areas where we have Native American tribes and in the tribal data themselves, they are already hitting the dark blue to quite dark blue ranges, which is 15% to 20% or over 20% of their

children have body mass index greater than the 95th percentile. Once again, the norm should be 5%, so we have a lot of work to do.

If you look at the medical complications, this is not what this talk is focusing on, but I just want to give you a list. This is a laundry list of things that we look for in the clinic when we see children that have, what we're looking for we call the comorbidities of obesity and overweight. PCOS stands for polycystic ovarian syndrome which is irregularities of the menses in older girls along with hirsutism and other androgenic effects. SCFE stands for slipped capital femoral epiphysis which should happen in an overweight children, but basically, the top of the hip, the femur, the femoral head, it can slip off of the femoral neck and cause limps. But all these other things once again, I think that we look at, and this is one of the major reasons why we're concerned as more of the population becomes obese, that these are going to start to show up more. Now, as you know the number one issue is type 2 diabetes and impaired glucose tolerance.

The psychosocial complications are even more important to look at though, because one might say this is chicken versus egg. If you have someone who has morbid obesity, for example, and they have a diminished self-esteem and diminished body image and become depressed, does that then lead them to eating more, and then that leads to more obesity or vice versa, were they depressed in the beginning and then they ate more and then they became obese. It's hard to know, but having the coincidence, psychosocial complications, can prevent the family from having self-efficacy, can make it extremely difficult for us to treat that patient and to help them realize their goal of achieving a healthy body weight.

So, just things to think about, that we can't just focus on the medical complications. We need to obviously look at the milieu in the family, but the psychosocial complications for each individual. Those of you that work in diabetes know that depression in adolescent diabetics is extremely high and often leads to lack of self-efficacy and lack of glucose control. We can't ignore those mental health issues as well.

Getting to how we can treat this is one of those things that we always want to go back to sort of ontogeny, what causes obesity? That's like the million-dollar question obviously and there's a huge amount of work that's been done over the past 15 years to figure out what is predictive of overweight in children. What correlates to the eventual overweight in adulthood? For example, do we really have to worry about an incredibly chubby six months old? I can tell you that when I went to pediatric training that we were told that you didn't really have to worry until they were two. That, you know, someone who's chubby when they were age two that was actually kind of normal. As you know, the body mass index graphs don't go below age two. We don't have normative data for BMI in kids under age two. However, we now know that especially with epigenetics and with other eating patterns that we may have missed the boat on that one. And that what happens before age two maybe a huge determinant in what's going to be eventually overweight in an older child or an adult.

One of the big issues is of course parental weight versus child weight. As you'll see in a subsequent slide, the BMI of the parents can be highly predictive of what a toddler is going to have as their BMI. When that happens, that may actually lead to an early adiposity rebound or, once again, when they have an inflection point in their growth, that is thought to be highly predictive of what percentile a child will end up in as an adult.

Who has the highest risk of being overweight and obese as an adult? For infants, it's the children who are ironically large for gestational age, that kind of makes sense. But also, if they are small for gestational age, or an infant of a diabetic mother, they actually have the highest risk of being overweight or obese as an adult. If they are toddler, if you're born to obese parents and it's actually multifactorial and if you have one obese parent, you have a high risk. But if you have two obese parents, it's significantly higher that you will be an obese adult.

If you're a child by age five, if your BMI is greater than the 95th percentile, and as I showed you in the other slide, that's talking about 15% to 17% of our population now. You have a high risk of being an overweight or obese adult. Once again, if you're born in poverty, if you have food insecurity, if you have parents who have lower educational attainment, you have a higher risk of being obese as well.

I put the casino openings and reduction of obesity up there to remind me to tell you that there is an interesting study that was published in 2014 that talked about Native American tribes and casino openings, and increase in income. An increase in income alone actually showed some reduction in BMI in the children who, of course, were not gambling but were receiving the benefits of the economic growth for their tribe, and that showed a statistically significant reduction in BMI although if that will be sustained, that was actually just assessed basically two years after the income change, so we'll have to see if that's sustained.

If you look at all of these factors and since our Native American people have an increased risk of these things, the question becomes, are Native American children going to be disproportionately affected by being overweight and obese as adults?

We definitely know that there are some genetic reasons that people can be overweight. For example, there are issues with leptin sensitivity. Leptin is an endogenous; it's called an adipokine. It's secreted by adiposites or fat cells and then actually controls satiety signals. For example, when you eat food, you basically secrete some leptin. The leptin goes to your brain. The leptin receptor will say, hey, you've eaten food, you should be full. That's great. But we know that there can be mutations at any of these things, the leptin itself, the leptin receptors, so these other receptors that also seem to affect people's sense of satiety and they overeat and then they become fat. However, is this the reason most people are fat? No. This is not the reason.

We do know that these mediators from the fat cells are present in all people and they have done lots of studies now in the past 10 years looking at what the role of leptin is in terms of once someone is obese or if someone is -- if they are obese, for example, and they don't become diabetic versus they do become diabetic, what's the role of leptin? But genetic mutations in any of these receptors or any of these adipokines are not the reason the vast majority of the population is obese, at least as far as we know.

The major genetic reason is what your family is, unfortunately. If you look once again, the predictive adult overweight at age three is a parental BMI. It's three times higher risk if one parent is overweight. The predictor of overweight at age five is the child's BMI, so the intervention that we have to create between ages two and five is to really look at the parents and the parents' eating style, and how that determines the lifestyle for the child.

They have all of these twin studies that are in the literature about almost everything. It kind of amazes me that there are that many twins out there they get raised in separate environments, which is kind of a bummer. But they do these studies and they have shown that they have a similar response to diet manipulations and they have a similar BMI even when they're raised in totally separate environments, so there's definitely is something genetic about what your -- I mean, you all know there's the big-boned family. There is the skinny family. There is the girl that can eat anything and never get fat. But in terms of the actual genetics of how those works, the question is, is this really genetics? Is this nature versus nurture? Is it a pattern of eating and a lifestyle behavior?

One of the things that also to focus on to remember is what can we actually change? For example, can I change if someone is SGA? Can I change if someone who's an infant of diabetic mother? Well, we can certainly try and keep babies from being small for gestational age or large for gestational age if we can by managing the pregnancy more aggressively.But these are couple of the things that we can really potentially intervene with. For example, can we encourage people to breastfeed? I'll go into data on breastfeeding in a second. Breastfeeding versus bottle-feeding as you know is felt to be more

beneficial in terms of prevention of obesity. If you look at maternal diabetes, maternal diabetes, or especially diabetes during pregnancy, is a huge factor in terms of determining potential diabetic risk for the child later.

If you look at maternal diabetes however, if you get good glucose control during pregnancy, that actually decreases the risk of having an either LGA or SGA baby and may actually have huge amounts of impact on whether the child develops diabetes and/or adiposity rebound later. There's some work that was done by Dana Dabelea, who also works in Indian Country on a SEARCH project, but also works for University of Colorado, the diabetes center. She was looking at non-Native children and non-Native mothers who had type 1 and type 2 diabetes, and she showed that improved glucose control during pregnancy impacts later development of diabetes in the children.

One thing with epigenetics, the question is, we don't know everything about what causes epigenetic changes, but many of you have probably heard about epigenetics. Basically it's that we all are born with a certain chromosomal complement but the environment in which we are raised both postnatally but specially antenatally may affect methylation, glycosylation, and other chemical mediators that go, or ligands that go on to the actual DNA strands. The DNA strands maybe interpreted differently, at the time of replication thus causing genetic variations even with the same genetic makeup, because of the epigenetic environment.

There is some work being done now on chronic stress and adverse childhood experiences. The thought of bathing someone in a soup of cortisol and epinephrine changes your epigenetic makeup which then makes people more predisposed with all of those stressors to obesity and also to subsequent development of diabetes. The jury is not back on this yet and there's going to be a lot of work done in epigenetics in the future.

Once again, as I think I mentioned before, SGA infants interestingly enough, even if you're born small for age or premature, there's a lot of catch up growth that's done in the first year of life. The question is do we change their satiety signals because we overfeed them, because we're so aggressive about being those children? And they lay down a lot more fat mass than they do muscle mass when they're growing so rapidly in our NICUs, in those first couple of months of life. So, therefore, SGA infants maybe setup from the first year by what we do with them, not allowing them to be SGA postnatally. LGA infants once again, in utero over-nutrition, persistent increase fat mass and the question about leptin sensitivity. Once again, the diabetic environment itself is just about over nutrition or something epigenetic.

The big confounding factor for all of these is that, many of these, our mothers and fathers have an elevated BMI, so how do we actually tease out that as a predictive factor in addition to all of these other chemical factors?

Focusing on breastfeeding and obesity, many of you may have looked at the Let's Move! in Indian country website and Let's Move! Website. One of our big efforts in Indian Country is to be making our hospitals baby-friendly. Baby-friendly hospitals improve breastfeeding rates worldwide, not just in the United States. When we first started here in Tuba City, we noticed that there were no hospitals in Arizona that were baby-friendly. It's quite a rigorous program. It's very intensive, labor intensive. It takes several years to go through, and we're really proud to say that all of the federal facilities have become baby-friendly. We Tribal facilities have to catch up a little bit. But breastfeeding has been shown, and I'll show you the data, to impact obesity risk later on.

If you look at this once again, we don't know why this actually happens because there are, like I said, confounding facts, variables, that mothers who are able to have sustained breastfeeding for the first year of life, usually have higher socioeconomic status and higher educational attainment because they have the luxury of not having to go to work or potentially have more time and a more flexible schedule to have more time with their baby. But there are also may be some other things regarding learned

behaviors, like learning how to have -- when you're full as opposed to being overfed with a bottle. Breast milk flavors, breast milk has different flavors depending on what mother is eating. So, exposure to different flavors may increase the likelihood of acceptance of a variety of foods later in the child's life.

There's also this question about increasing leptin responsivity, and then, once again, changing how adipocytes are distributed in children who are breastfed versus bottle-fed because there are different weight gain curves for children who are 100% breastfed than those who are bottle-fed. They've also shown that there's increase in circulating plasma insulin in formula-fed infants compared to breastfed infants. Does this potentially set them up for insulin resistance in the future? It's hard to know. There are lots of studies going on about this. But if we look at the breastfeeding literature, this was actually what came out in 2005 and this is what's called a "forest plot".

Those of you that are not in medicine or in statistics, the forest plot basically take all of the studies that are listed on the left-hand side and that the number of subjects is listed in each one of those. So these are not large studies. And it looks at what they're effective and zero means that there's no effect. So, if it's to the right side which is a mean difference in BMI, we want this to be negative. We want kids to be skinnier. So you can see that if it's more to the left, that's better. If it's more to the right, it shows that it didn't really have a big effect. This data unfortunately shows that it doesn't hurt but it's really not extremely conclusive to show that there's a huge difference in BMI, okay? I mean, if you talk about a mean difference in BMI of one standard deviation, that's not that much if you're talking about when we look at an impact on kids who are greater than the 95th percentile in terms of their BMI.

However, there's been more work done on breastfeeding and obesity lately and you can see that there has been the positive effect of breastfeeding on BMI noted in these studies. For sake of time, you guys can look at these on the handout because there are lots of confounders in all these studies. But the more recent data looks at this forest plot, which shows once again, favoring A means favoring prolonged breastfeeding. You can see that more of them are long -- this one actually uses zero, once again, in the center here. I realized you don't have -- I don't have a pointer, but an odds ratio -- this is slightly different because the other one was favoring BMI change. This one is about an odds ratio, so an odds ratio of one means that there is no difference and you can see that the odds ratio favoring breastfeeding is significantly higher on these. However, once again, how that actually shows up in terms of what the impact is on each individual child is unclear.

If you look at the – once again the forest plot is a little bit complicated, but it shows the more recent data is more in favor for breastfeeding. But like I said, we know that breastfeeding has lots of other benefits in addition to obesity, so having a baby-friendly hospital is going to help all of those kind of things, not just obesity but the immunity of the baby, the bonding with the mother, mother's health, lots of different things. But you can see that many, many different studies are still in progress regarding the benefits of breastfeeding.

Now, let's move on to other things besides breastfeeding in the infant milieu. Let's talk about the preschool milieu and the childhood. Once again, the question is -- I don't know if you saw this old funky show called, "The Iron Chef", the original Iron Chef not the Iron Chef America that has all of these celebrity chefs in the U.S. But the original Iron Chef was a Japanese competition show and the guy in the corner is not related to me, but he is actually Chairman Kaga, who is this actor who basically is in charge of kitchen stadium and he would say at the beginning of every Iron Chef, he would say, "Tell me what you eat and I will tell you who you are." That is kind of where we are with obesity I think, is that we know that whatever children are eating, whatever our society is eating has changed and it may be playing a huge part in terms of why we're all becoming more obese.

So what do we think contributes? Well, dietary issues are one, increased sweetened beverage consumption, two, increased caloric density of the foods that we eat, especially the snack foods and fast foods, meals purchased outside the home, in the restaurants we're using. The bigger issue especially for Indian Country is food availability and food insecurity, the concept of a food desert. The

other possible contributors are changes in the actual competition of the food we eat, increasing portion size, I'll address the issue about high fructose corn syrup in a second, and then, antibiotic exposure.

Antibiotic exposure is a new study. Many of you have been hearing about the microbiome and that we all -- one of the new trendy things, especially regarding some medical issues is, are we changing people's microbiome by not only giving people antibiotics to treat multiple infections, but also by putting antimicrobials into our food supply, especially in terms of animals who have antimicrobials in their food. It has been shown that in livestock, if you give them antibiotics, they grow faster. So, the question is, is the increased exposure to antibiotics in our society acting as a growth stimulant in our children? Intrapartum exposure to antibiotics, we now routinely give antimicrobials to pregnant moms who have group B strep, which is about 25% of our population in the U.S. More early infant exposure when the child comes in for example with an ear infection, et cetera. The effect on the gut microbiome is unclear and the relationship between the gut microbiome and eventual obesity and caloric absorption is unknown. It is currently unknown. But there are many rodent and mouse experiments going on right now looking at administration of antimicrobials to these tiny little infant and childhood rodents and they do grow more. They actually grow fatter just with the only difference being not what they're eating but having antibiotics in their early life. So, this is another issue that's going to be up and coming about whether we need to change our prescribing practices, especially in the issue of antibiotic exposure and the food chain.

If we look at the sugar containing beverages and sweetened beverages, this is a study from Pediatrics in 2008. You can see the main reason I put this in is you can see that the actual number of kilocalories that the average teenagers eating is about over 300, which is over 10% to 15% of -- the average teenager is a probably eating about 2,400 calories, a growing teenager. And if you look at that, you can see that they're taking about 10% or more of their calories as sugar sweetened beverages or other beverages and that's a big change as we can see between 1988 and 1994, and the time that this was done which is about 10 years ago. The other thing is the proportion that is soda pop is increasing, and soda pop, fruit punch, sports drinks all contain high fructose corn syrup. So the question is, is high fructose corn syrup one of the culprits or is it the drinks themselves? And that's the question that's being answered right now.

The issue is also once again of portion size. Because if you look at the difference in portion size from 1955 when McDonalds first started compared to it now and you look at candy bars, the portion sizes have doubled or tripled in terms of the number of calories per portion and many of you who worked with patients know the patients don't get. That if a bag says 150 calories per serving, but the serving is, there's three servings in that bag, they think that small bag is one serving. So they don't make those calculations correctly.

So, once again, the concept of supersizing and the learned behavior to eat it all, if you take normal children who are two, they don't want to eat it all. They'll actually take portions that are very similar to what they're going to eat but we, the parents, encourage them to clear their plate and not waste food, especially in a family where there may be food insecurity or economic reasons.

So if you look at this, you can see that there's a learned behavior to eat all so we've done that, the society has. The economics of fast food are, you can actually feed a family of four with 20 bucks at KFC with this great meal that has probably about 3,000 calories per person. But it's a heck of a lot cheaper than going to the local store, which may be a food desert, buying some expensive vegetables and expensive chicken breast and cooking them and spending the time to cook them. So unfortunately, we have made it so that fast food is easier for people to eat even though the caloric density is incredibly high, and more than we actually need.

The other thing about food insecurity is that when people don't know how much food they're going to get in the future, there've actually been some studies done with children to show that they will overeat in anticipation of having some times when they will be hungry in the future. Also, there's been shown

that if you are overly restrictive by telling children they can't have something like they can't have cheese puffs or Red Hot Cheetos, they're going to want them even more. And they've actually studied that with behavioral studies with toddlers.

So many things are learned both as a function of our society, and our families. So many of you may have seen this movie, the Supersize Me with Morgan Spurlock, obviously, it was a bit of hyperbole but it is really true that the portion size and the competition of the food that we eat now is very different than what we had 50 years ago. And this is from the New Yorker magazine, as you can see, this is kind of what we all expect now when we see a very small portion. It's interesting that the more expensive the restaurant, the smaller the portion so that the cheaper the restaurant usually they try to give you a lot more food and unfortunately, that may be one of the reasons why we are all becoming obese.

Many of you remember the old four food groups, and then we got the food pyramid and then people were totally confused and didn't understand that at all. So as you all know now the USDA, in cooperation with Michelle Obama and Let's Move!, and the Department of Health and Human Services, is really looking at changing us to ChooseMyPlate.gov. It's a very simple way of looking what people need to eat. It focuses on having large servings of fruits and vegetables, that we really don't need that much protein. Americans in general, eat way more protein than any other country, and dairy products. You know, dairy products, that's a whole other issue that we're not going to discuss today. There is some information about people who drink more milk actually have a lower risk of obesity but they don't know whether it's from calcium, whether it's the milk proteins, or it's the casein, or whether it's the fact that it displaces other calories like soda calories. That, once again, is still being worked on also.

But really looking at something as simple as ChooseMyPlate.gov and many of you may have seen MyNativePlate.gov, it's just focus on the fact that really half of your plate should be fruits and vegetables. And I can tell you that a lot of our families don't do that. They actually have a lot of grains or starch. They think that a potato is a vegetable which technically it may be but it's more of a starch, and a lot of protein. And so, if we can get our families to switch to ChooseMyPlate.gov, it's a pretty simple paradigm. We sometimes just take paper plates in the clinic and just draw an X in it and say, let's have you take this home or we have a placemat that looks like myplate.gov and let them take it home."

Looking at fruits and vegetables, a lot of people want to know what happens with our children who are on food stamps for example or people who are in low socio-economic status. And what happens in terms of -- they don't have -- they live in a food desert, they don't have access to fruits and vegetables. You can see that this is, when we did the NHANES study and this is all incomes, it's not just low income kids, and this is kind of a busy slide. But what it does show is that people have increased their fruit intake with all of the advertisements that we've had about increasing fruits and veggies. They have not increased their vegetable intake. Unfortunately, it's kind of this flat line at the bottom. Fortunately, the whole fruit intake has increased more than fruit juice, because fruit juice as you know actually has a high caloric density and does not add the fiber and the benefit that whole fruits do. But the issue is if you look at lower socio-economic status patients or families, they do not have access in their community to some of these fruits and vegetables. So we have to teach them how to substitute things like frozen or commodities or things like that so that they can have the same achievement of increasing fruits and vegetables.

If you look at fruit and vegetable consumption for adults in the U.S., this is old data but this is one of the better graphs I could find. You can see that as adults, we do a terrible job as well that less than 30% of us, even if we're highly educated and have a good income, even eat the recommend fruits and vegetables that we should. So that's one focus in terms of what we're eating as well as how much we're eating.

One of the questions I am asked is, is it more expensive to eat healthy? And this is a big question especially for a family that are food insecure or living in a food desert. There have been conflicting

results from multiple studies but the latest Cochrane review in 2013 showed a couple of things of interest like subsidies or reduced pricing of fruits and vegetables will increase purchasing and consumption especially in at risk populations, low income and obese populations. So that's something we're going to focus on when we talk about action items for the future.

And then there's the role of school-based nutrition programs. Remember that families that have lower socio-economic status are at higher risk of having obesity potentially because of the food insecurity and inability -- and food deserts. If you look at the economics, many kids with low SES will have two or three -- two out of three meals a day at their school nutrition program. So that's the focus on school nutrition programs and the new USDA standards. As you know, all of us probably ate school lunch some time when we are growing up and it wasn't exactly beautiful or tasty, but there has been a huge effort now to really change that. There's a partnership between chefs in schools, there are some new recommendations of federal guidelines. But we are still working on the issue about food acceptance by students.

I think my next slide will show you that in 2004-2005 before the Healthy Hunger-Free Kids Act of 2010, only 6% to 7% of schools met all the required nutritional standards in their school lunch program. This has unfortunately changed with the new legislation in 2010, in increasing funding, which ironically doesn't sound like very much but even increasing a dollar per student a day can totally change the way people are provided their food.

The 2010 Healthy Hunger-Free Kids Act improved standards for school lunch and breakfast programs. Multiple studies were done looking at fruit and vegetable selection consumption. Ironically, with these new standards kids will increase more fruit selection. They do not increase their vegetable selection but they actually eat more of the vegetables that they do select, and that the food waste has not changed. And this has been done in multiple different settings, urban, rural, Wisconsin, Tennessee, New York, and there are lots of papers that you can look up with this. So the good news at least it hasn't increased waste, the bad news is it may -- it hasn't really increased vegetable selection. We have a way to go on this, but we're moving towards the right direction.

So this is probably the take home from our synopsis. We should eat food, not synthetic food. We should probably not eat too much. And we probably should eat mostly plants. And if we could convince people to do that, that would be probably the healthiest way to do this. Unfortunately, some people don't have healthy food, and we'll look at that in a second.

The other issue is about physical activity. And physical activity is a little bit harder to quantify. We know that our society is more sedentary, there's television everywhere, there's media everywhere. People are using it all the time at meals, in their bedroom. They have screen activities with their smartphones or what we call it, in our house, a smarty-pants phone. We have other screen activities like using computers at school. They have video game consoles, et cetera, so it's everywhere.

There is also less physical activity. We cannot, however, blame P.E. in schools for this epidemic of obesity. Certainly, we can improve P.E. in schools but it's really not, this is not the main reason that people are not more active. Probably the main reason is we have less non-school activity that is active. One interest of recreation versus competition, one has to do with access and safety for urban kids or rural kids who can't get to school by walking and then transportation issues.

With television obesity, we know that greater than five hours of screen time is a four to almost five times increase risk of overweight in the 1990 data. The presence of a TV in the bedroom is associated with increased risk of obesity in teens and preschoolers. An increase in screen time is associated with increasing caloric density while you eat because you don't even look at what you're eating. It shows you all this ads for juicy, tasty, wonderful tasting food and you snack more especially when you're watching television.

If you make one very simple suggestion, tell your patients, turn off the TV while you're eating and take the TV out of your children's bedroom. Those are simple and those are passive because then the kid can't protest, hopefully. It's a little bit difficult to tell them you can't watch television at all, but a lot of studies show that those two things as well as having something called the, "You have to earn your TV." Like if every hour of exercise, you can have an hour of TV. Those are some philosophies that have actually worked in terms of reduction of weight and increase physical activity.

And so here are some examples of the transportation issues. Many of you may have walked to school but especially in Indian Country, people have to take the bus, because they live very, very far away. How can we create other venues for kids to get exercise on their way to school or at school? And not necessarily competition, our Native American kids are great at sports; especially we're really proud here, in Navajo country in terms of our cross-country teams and our basketball teams. But sports is not for everybody and so try to create more active environments is what we could do especially as we get to the advocacy section.

This slide is put in just as a joke, you can see that actually by giving this lecture, even though I'm not standing up and I'm sitting in my computer, I'm spending twice as many calories of those of you who are sitting down there and listening.

So this is a part where you guys have to look at yourself and say, what can we do? Because if it was easy, everyone would be doing it. I don't know if you saw this movie, "A League of Their Own", where Tom Hanks is this alcoholic, broken down baseball player, becomes the manager of the women's baseball league during the war. And he said, "If it was easy, everyone would be doing it." Well, if it was, we'd all be doing it. Unfortunately, it's not easy.

If we talk about treatment which is, and this is going to be a very brief section, is one of the things that we have to do first is be willing to identify who is affected. You'd be surprised how many people just don't want to know, both as a practitioner, as well as the patient and the family. They just don't want to know. And if we won't address it, it's kind of like; the first part of the treatment is acknowledging that this is an issue. So maybe use as BMIs, first identify who is affected and who is at risk.

You need to talk about lifestyle interventions. We'll talk about primary care and tertiary care. There are some drugs that do treat obesity but for use in children, they are not very successful. And then bariatric surgery, I include this because this is the only intervention that has been shown to be clearly effective in reducing BMI. Not just statistically significant reduction but actual clinical reduction that reduces the risk of diabetes and reduces the risk of the morbidities associated with obesity. However, as you know, this is not a simple fix in any way shape or form and can only be used in mature adolescents.

We need to identify the children that we talk about and we needed to identify the teachable moments where families and children who are ready to hear that they need to do something about their weight. We use something here; it's called the Behavioral Motivational Interviewing technique. Once again, for the sake of time, I don't have a lot time to go into this but the key is, there are three elements in terms of having a motivation scale, assessing the readiness for change, and creating a brief intervention with the child and the family that they feel that they can be successful and self-empowered to accomplish.

The most important thing for this for those of you who are clinicians, is motivational interviewing is actually fun in the sense that if they say they're not interested, if you say, "On a scale of one to ten, how motivated are you to actually make change?" And they say one, you just walk away. Don't waste your breath. They're not ready to hear it. You're going to be wasting your breath. Just walk away. It makes your life a little bit easier, even though you may be sad and dying inside because you want to help that child. But you need to remember that if you do use the technique correctly, they have to make, they have to be motivated to do that. And one of the things in saying, if you are a five, what would help you make, make you a seven? Make them address this issue. Like I said, there are a lot of references that we'll talk about how to use the motivational interviewing technique in the future.

We talked about bariatric surgery. Once again, it is the most effective intervention we have, but the data on kids does not exist. It has been used in mature teens. The only people that will be eligible for this currently with a BMI of 40 with comorbidity or a BMI greater than 50 and hopefully, we don't have a whole lot of kids with this, but we do have some. They need to be a Tanner 4 or 5, which means that their physically mature, and they have to have a failure of at least six months of intensive diet, exercise, and management. And the issue is that most of our facilities do not have the ability to have this kind of a program. Probably, at this point, shouldn't have that kind of program unless we really sit down and say, a comprehensive program including mental health counseling, nutrition, home visitation, GI, surgery, a whole group of people that are -- as well as diabetes are all following these people. And not just children, we're talking about adults as well. These are the different techniques, many of you may have heard about many of them. The newest one has to do with putting this thing inside your stomach that takes up space and then you can remove it later, so it's not permanent surgery but they're clearly experimental in children. And lap banding is the other thing that's going on a lot in terms of adolescents.

So now, let's talk about an ounce of prevention, because this is where the money is going to be, I think. We need to attack the myth that healthy food taste bad or cost more. We need to attack the myth that exercises work or it has to be sports. We need to make sure that teens and children don't worry, that they think that they don't have to worry about being unhealthy until they grow up. Because we know, what they are doing in ages two to five is going to determine what they are when they grow up. We need to try and say, hey you're this impressionable little kid who still cares what I think. You really care what adults think between ages three and five. That's when we, that should be our first target and then moving up the age, especially when they become women of child-bearing age, fathers, because that's going to determine what you're children are going to be like.

We need to make a campaign that involves kids in planning to make it appealing to kids. We as adults often think that this is going to be appealing to kids. We are wrong. We need to really try and get youth involved in our focus groups when we make a campaign. And we need to use things like media, like social media. So here's an example of what I think are two very funny billboards, would you rather be that cute girl doing a shopping spree or the one that's says, "Child obesity, don't take it lightly"? I think it's clear which one is more appealing to a teen.

In terms of advocacy, remember that you need to think about, do you want to do it on an individual level with your patient, if you're a practitioner, or if you want to go to the community level, especially in schools, workplaces, and community programs. Or do you want to take it even further, let's go to a state or a national level. You guys all have unique situations, especially in Indian Country that your Indian community and your Indian governments maybe more are responsive to you as a local practitioner than if you're trying to do this, like at the Arizona state legislature or at the national level. So we have a unique opportunity in Indian Country to be advocates for our patients and our families.

The issues with this slide, basically, is to show that you have a limited impact with an individual, but you can have a huge amount of impact to decide to do a group intervention or an environmental change. Especially one with food deserts and with schools because that affects the entire community.

Yes, this kind of came out looking a little bit weird, but for example, the 5-2-1-0 program, many of you have heard of that, many different tribes, many different communities, many different academic centers are adopting this very simple easy message. Do we know that any of these things are proven to reduce obesity? We don't. We do know that limiting sweetened drinks as long as you don't replace them with other high caloric substances, will decrease BMI over time. We do know that being active is more healthy but the amount of time to be active is up for discussion right now. There's some new discussion about less than 30 minutes of highly intense physical activity, may be better for you than having one to two hours of kind of slow activity. But some of our patients can't do highly intense physical activity. The screen time is once again, a statistical association with obesity. And the fruits

and vegetable are good for colon cancer, heart disease prevention. But once again, if you live in a food desert or are food insecure it's hard to get those sometimes.

The Prescription for Healthy Living Program is an example of what you can do if you are a practitioner. It's very clear if we give a prescription to patients, they regard it very differently than just giving vague instructions. It gives the patient a clear directive of what to do, and so for example, this is an example that was printed by the Academy of Pediatrics. You make this prescription and you hand it to the family, and you say this is what you and I agree to do. This gives them a very clear direction of something that maybe achievable.

If you look at this new other program, one called Fruit and Vegetable Rx; this is piloted by a group called Wholesome Wave, done actually in the north and northeast area and near Boston, with low income families in Boston. They're now expanding this across the country including in Indian Country here on Navajo. The questions, you write a prescription for fruit and vegetables consumption, you give them "Healthy Bucks" that can be used at a farmer's market or in a local store and that increases fruit and vegetable consumption. So actually doing clear, directive instruction for families.

In terms of an environmental intervention, working with schools, we've already talked about some of these, especially regarding nutrition. And MVPA stands for "Moderate to Vigorous Physical Activity" in the school setting. We talk about during brain breaks, because there is actually some evidence increasing physical activity in school, improves academic achievement, which is contrary to the concept of we are going to keep you in from recess so you can learn more during that time. We need to encourage our schools to look at that data and improve recess activities, non-competitive sports, physical activity during the classroom hours.

We talk about community environment, these are a lot things that, these seem to be a little bit more difficult to achieve because you have to empower the community to do some of these things, but they will have more impact because if you change their physical activities, like you build a wellness center, you create a skate park, or you put up a basketball hoop, that affects a lot more kids than that one child that's in your office.

So try to do those things as well as looking at the food desert issue. Once again, food deserts are places where, ironically the CDC says that there is no grocery store within a mile in an urban area, that's a food desert, and in a rural area it's ten miles. Many of our Native American people have to drive 75 miles to get to a grocery store with healthy foods. So with that, we need to look at in terms of environmental structure, creating attractive ways to eat fruits and vegetables within a school for example. Or creating cool ways to eat fruits and vegetables like making a little mermaid out of a banana and some fruit. Things like that that will appeal to children. Encourage them to have water bottles and drink water all the time. Things like that are environmental changes that will affect many more children.

Just Move It! is part of the Let's Move It! program as well. And as you guys know, Just Move It! has been around for quite a while, these are pictures from our Tuba City group. Engaging the community, saying this is a thing to do. It doesn't matter what shape you are, it doesn't matter what color you are, it's doesn't matter what age you are, this is the type of youth activities, are things that we create venues and we affect more people. But they take time and they take energy and they're different than having them in your office. So think about maybe one thing to do in your environment that might change something.

On the national side, there's a lot going on, there's a lot going on with the WIC program, commodities program. The food stamp program is kind of a sacred cow which is very difficult to change in terms of, many even say, why can people buy things that are bad for them in food stamps? It's about personal choice, and so I think we're not going to make a lot of room in that and not make it like the WIC

program where you are only allowed to buy certain things. But, certainly, opportunity, if we can create opportunities, you'll create choice architecture that helps people choose healthier foods.

For example, in the Navajo Nation legislation that happened in 2014, there's an additional tax. It's been shown that if things cost more, people have a disincentive to buy them. Just like if you get subsidies on things that are healthy. So this is what the Navajo Nation has chosen to do, to increase eating healthy foods and decrease unhealthy foods.

This was commissioned in 2010, once again, the White House Task Force on Childhood Obesity. It's 124 pages so it's less than the ACA, then you possibly read it. But the most important thing it has all these recommendations of things that you can do within the environment. So once you get together a group of motivated people within your community, within your health service, within the people that, even within your PTA for example and say, let's figure out one thing, let's not do all 97. Let's figure out one thing at a time that we can create, we can be advocates for and really change the environment for our children.

Once again, these are the four goals that are in the Obama program, you can see what the, they're actually on the first page. Anyone of these things will make a huge impact on those children. The Let's Move! Web site, you already saw the Let's Move! in Indian Country website, this is the national website they are linked to each other. Once again, this has to be user-friendly for not just us, but there's data for us as healthcare professionals, there's data for families, there's data for legislatures, there's data for school personnel. It's a really great website to look at. It even has recipes. To the USDA website, this is We Can!, there's a lot of focus here on the web.

So what can we do? As we're trying to slow down a little bit, once again, we are trying to measure the BMI. We're trying to reinforce the 5-2-1-0 prevention methods. Use motivational interviewing. Identify resources for your family, sometimes they feel like they don't know where they can go to exercise or where they can go to get nutrition advice.

The most important thing in being an advocate is to really engage your partners. Engaging partners makes it easier for everybody. You have 20 partners. You have 1/20 of the work. If you're trying to do this all alone, it's very difficult. And the best thing is also if you can walk the talk, if you can be out there with them doing the Let's Move! activities, helping them with cooking demonstrations, something even as simple as making a meal for someone at a cooking demonstration with HPDP, can make a huge impact on some of your patients and some of your kids.

So, in summary, I kind of zipped though this because we're kind of short on time, just want to make sure you all know that once again, we don't know exactly why people are more heavy. We know there are a lot of multifactorial reasons. But the more important thing is we can make change. We can be advocates for our communities and our families. You're the experts. You guys are the ones who have all these data now. You can show them being more active increases their academic performance, you can show them that choosing five fruits and vegetables will also improve their BMI. Good things like that, the data is all there and they are all on this websites and in the presentation.